platform solutions
on-line news for the hardware developer

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Feature Story
Each month we'll provide a feature article on key industry trends and developments. Authored by a member of Intel's Executive Staff, you'll find insightful and useful information for product development, planning and execution.

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Delivering an in-depth report on key platforms, products and technologies, our Top Stories provide a monthly source of information on the issues affecting hardware developers. Be sure to check in every month for the latest stories that are driving the evolution of the industry.

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On behalf of all of us at Platform Solutions, welcome to the future of the PC platform!

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Feature

Balanced Platforms for Unique Consumer Needs

By Mike Aymar
Vice President and General Manager
Consumer Products Group, Intel Corporation

The home PC market has evolved into unique segments with varying product needs. At the high end, avid PC users look for high-performance "Enthusiast PCs" which combine the fastest Pentium® II processors with the latest technology advances. For mainstream users, "Performance PCs" with Pentium II processors provide the speed and features necessary to meet their computing needs now and in years to come. At the low end, "Basic PCs" are providing features necessary to meet the core computing needs of many new users.

Creating Balanced Platform Solutions
Intel is working to stay ahead of market changes by developing balanced platforms that meet the needs of consumers across all price points. For enthusiast and performance PCs, we recently introduced Pentium II processors at 350 and 400 MHz. Not only do these CPUs have our fastest microprocessor cores yet, but they can also transfer data to the PC at 100 MHz—a 50% increase in system bus frequency. To complete the balanced platform around these new processors, we introduced the Intel® 440BX AGPset to manage data I/O across the 100-MHz system bus, enable Instantly Available power management, also enable AGP technology for fast 3D graphics processing, and to address up to 1 gigabyte of system memory. These technologies, when combined with fast 3D graphics solutions such as the Intel740™, DVD drives, and peripherals such as digital cameras, scanners, and force-feedback joysticks, bring a whole new meaning to the concept of the "PC experience."

At the basic PC level, the industry has also been changing rapidly. In the past, low-cost or basic PCs were typically outdated technology reduced in price to make way for the latest systems. Today, Intel is enabling design solutions and providing balanced platforms specifically created for the new, lower-priced class of basic PCs. This includes products such as the Intel® Celeron™ processor, the Intel® 440EX AGPset, and microATX form factor motherboards.

Enabling Innovative Software Programs
Through the latter half of 1998, Intel expects to see the continued evolution of content and content delivery. This includes Internet Web sites that make use of 3D objects and images, DVD playback and DVD interactive applications, arcade quality 3D, and creativity uses such as video editing and digital imaging. Intel continues to work with software developers to increase the number of applications that use the full capabilities of each new processor and scale with more processing power.

Looking Forward to '99
The introduction of new technologies brings new capabilities to the PC industry, all of which feeds the growth of the consumer PC market. In 1999, Intel will enable a whole new spectrum of balanced computing solutions with the introduction of the Katmai processor and Katmai New Instructions, along with enhancements to graphics and memory subsystems. Katmai processor-based platforms will have dramatically increased processing power for new content and media, and will be capable of connectivity with consumer electronics devices in the family room as well as the home office. With the introduction of Katmai, we will also see new, exciting applications, such as the PC VCR. PC VCRs use powerful processing for real-time MPEG2 encode and decode, enabling "timeshifting" where users who are recording a live broadcast can pause or instant replay any part of a show, then catch up to the show in current progress.

Bandwidth Bringing New Applications to the Family Room
In the family room, we expect digital broadcast and broadband Internet access to the home to create a new market segment. High bandwidth Internet access is coming in 1999 through different type of pipes: uADSL at approximately 1–1.5 MB/sec, digital cable at approximately 1–2 MB/sec, terrestrial (DTV), and satellite. These will enable new PC solutions such as consumer videoconferencing, personalized news and magazine software, video and music media distribution and enriched TV with data, among others. Intel is working on a wide range of platform capabilities around these technologies and will support the development of 10-foot applications and new broadcast applications and products, as well as consumer friendly interconnect solutions which link PC's, peripherals and digital devices throughout the home.

The Future of the Consumer Platform
Stay tuned to *Platform Solutions News (PSN)* for news on the consumer platform, and be sure to read the consumer platform-oriented stories in this issue. Intel is looking forward to an exciting ride this year and in 1999, as we continue to enable computing solutions and serve the needs of all PC consumers.

About the author:
Mike Aymar (http://www.intel.com/pressroom/kits/bios/aymar.htm) is Vice President and General Manager of Intel's Consumer Products Group. Mike is responsible for Intel's consumer business including products, platforms, and technologies.

For More Information:
Be sure to read the Top Stories on consumer platform technologies in this month's issue of *PSN*:

- Accelerating the Convergence, by Tsuneo Takahashi, General Manager of Intel Japan's Consumer Platform Development Group—
  http://developer.intel.com/solutions/issue/focus.htm
- DVD Spells Opportunity for the PC Industry, by Lila Ibrahim, DVD Industry Marketing Manager at Intel—
  http://developer.intel.com/solutions/issue/stories/top1.htm
- Adding a Dimension to the PC Space (3D Graphics), by Stan Mo, Tools Marketing Manager in Intel's Developer Relations Group—
  http://developer.intel.com/solutions/issue/stories/top2.htm
- HomeRF Extends the Reach of the PC, by Steve Whalley, Connectivity Initiatives Manager at Intel and Marketing Chairman of the HomeRF Working Group—
  http://developer.intel.com/solutions/issue/stories/top3.htm

For up to date news and information on the consumer platform, visit the Home Platforms page in PSN on a regular basis—
http://developer.intel.com/solutions/platfms/home.htm

For more information on Intel's products visit Intel's developer Web site—
http://developer.intel.com/design/product.htm

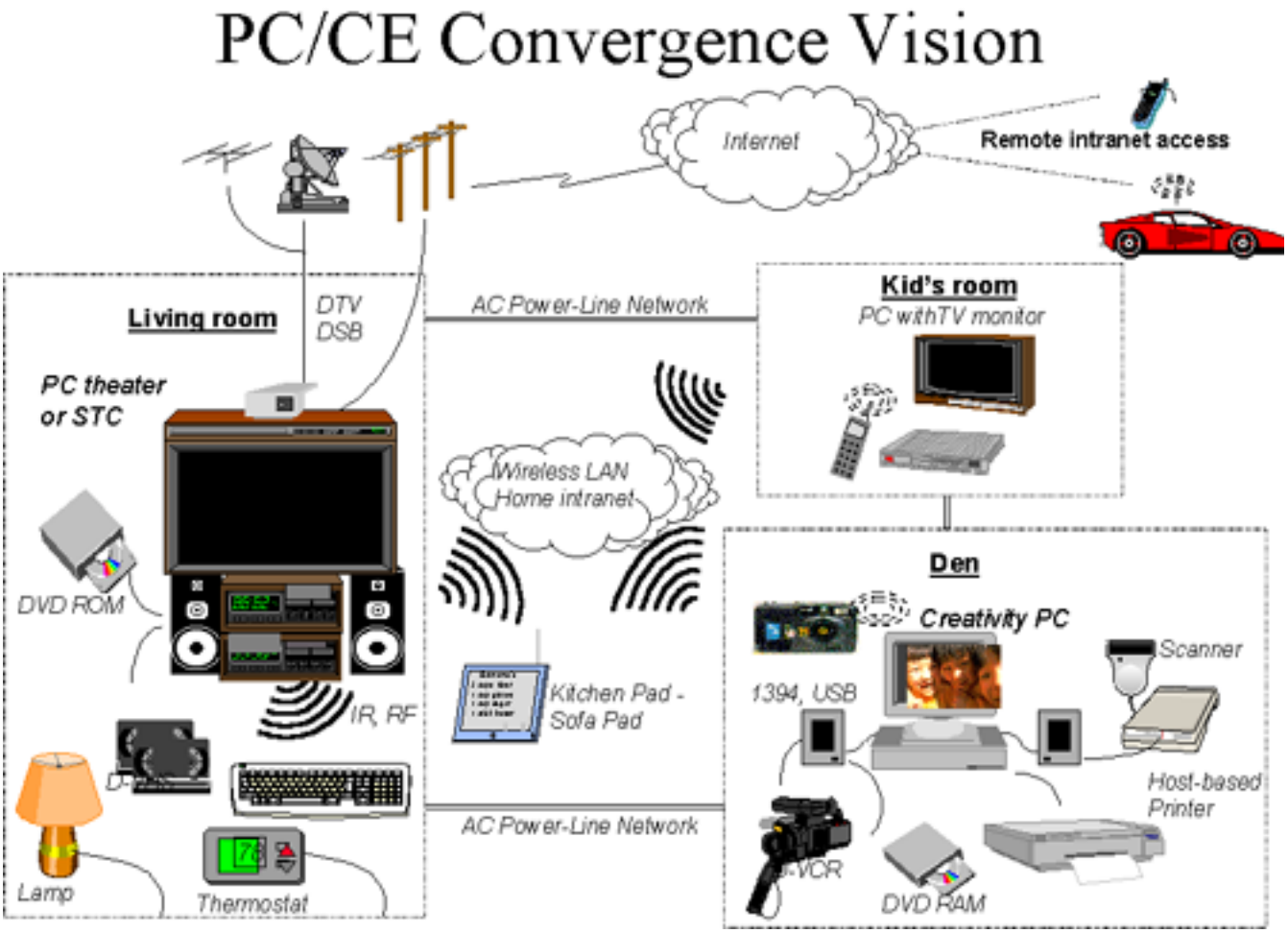
Focus

Accelerating the Convergence

By Tsuneo Takahashi
General Manager
Consumer Platform Development Group, Intel Japan

Imagine a scenario where you're ready to board a plane for home, and suddenly realize that you want to tape one of your favorite TV shows. You power up your mobile computer and establish network or telephone connections, through which you instruct your desktop PC at home to turn on your VCR to begin taping. For good measure, you also "tell" your home PC to turn on the heat and the lights throughout the house, to prepare everything for your imminent return.

While these capabilities are not yet in place, the day is rapidly approaching when they will be. That's because with each passing year, the worlds of consumer electronics (CE) and computing are drawing closer. From televisions to home entertainment systems—and ultimately all the way on through refrigerators and microwave ovens—the digital revolution is beginning to wield a huge influence in consumer electronics. This includes an emerging class of wireless devices brought on by the capabilities of the PC and home networks, such as kitchen pads that interact with personal information and scheduling software and sofa pads for viewing digital photo albums. These influences are creating a significant opportunity for personal computers to act as a central interface and point of control for the next generation of digitally enhanced CE devices.



Bridging the PC to CE Gap

In order for this vision to become a reality, a number of technological barriers must be overcome. Today, interoperability between personal computers and consumer electronics devices is constrained by the lack of appropriate network physical layer interfaces, incompatible protocols, and a need for common command sets and application programming interfaces (APIs). Resolving these issues will pave the way for connectivity between and among PCs and CE devices using next-generation home networks now under development.

Intel is doing its part to accelerate these development activities by working to better understand consumer electronics technology and bridge the gap between computers and CE devices. Fostering this understanding and driving technology initiatives to accelerate CE/PC convergence is the mission of Intel's Consumer Platform Development Group (CPDG)—a two-year-old organization based in Japan, where it can take advantage of proximity to a large concentration of many of the world's leading consumer electronics companies.

Through CPDG, Intel is working to create relationships with CE companies which help bring the value of the PC to consumers—by defining a new home PC usage model, by developing reference designs, and ultimately by demonstrating the viability of the technology. Already, the PC-based emerging HomeRF (http://developer.intel.com/solutions/issue/stories/top3.htm) local area network for home users is laying the foundation for an easy and affordable way to share computing and telecommunications resources such as hard drives, printers and Internet access on different PCs; extending that network to encompass CE devices is the next step.

Key Technology Building Blocks

Success in this endeavor requires PC OEMs and CE device manufacturers alike to develop products that provide PC/CE connectivity and application interoperability. Intel's CPDG is working to help drive key technologies—such as HomeRF, 1394 Content Protection and DVD Audio, to name just a few examples—through industry forums in which CE companies such as Sony, Matsushita, Mitsubishi, Sharp and Philips are actively involved. Efforts in this area must accommodate such existing protocols and standards as X.10, TCP/IP, and PIAFS (the PHS access forum standard for Japan's cellular phone data protocol)—all of which will play a role in developing a seamless home-based PC/CE device network.

In addition to its industry-enabling activities, CPDG is working to develop software technology for future generations of Intel's Pentium® II processor. For example, efforts are now focused on enabling the Pentium II processor to provide motion-picture quality enhancement by employing filter algorithms that change such parameters as motion picture saturation, contrast, hue and tint. As a result, consumers may be able to experience their analog content—such as videotapes—at a quality level near to what can be enjoyed with newer digital content, such as DVD. Similar audio/video and image processing applications for home entertainment are being enabled by MPEG2 software decoding and encoding capabilities.

Demonstrating PC to CE Viability

Intel's CPDG has developed a PC-based "connected CE" prototype system in its Tsukuba Lab designed to demonstrate the viability of the PC/CE vision. Based on a client/server networking model for the home PC network, which utilizes the X.10 protocol, PHS/PIAFS and TCP/IP, and is controlled by a distributed media link (DML) architecture, the system is targeted at a number of home CE applications. These include the automation of lighting controls, remote VCR control, music on demand, an on-line private piano school, and a Web-based message station—along with digital CE-class AV quality for home PC movie viewing.

These applications merely represent the tip of an expanding iceberg; where home entertainment leads the way, a host of other CE devices and appliances such as washing machines, microwave ovens, and wireless display pads are sure to follow. For consumer electronics suppliers and PC OEMs, the message is clear: next-generation products must all accommodate PC/CE connectivity in order to take advantage of a huge market opportunity that promises to unfold rapidly over the course of the next few years.

About the Author:
Tsuneo Takahashi is the general manager of Intel Japan's Consumer Platform Development Group, where he is responsible for overseeing Intel's relationships with consumer electronics companies in Japan, as well as all technology and specification development activities designed to promote interoperability between the PC and consumer electronics platforms.

For More Information:
Top Story on HomeRF in *Platform Solutions*—
http://developer.intel.com/solutions/issue/stories/top3.htm
Top Story on DVD in *Platform Solutions*—
http://developer.intel.com/solutions/issue/stories/top1.htm
Home Networking white paper—
http://www.intel.com/home/network/
1394 Content Protection—
http://developer.intel.com/solutions/archive/issue7/stories/top4.htm
DVD Audio—
http://www.intel.com/pressroom/archive/releases/dvd21998.htm
HomeRF Working Group—
http://www.homerf.org

Top Stories

DVD Spells Opportunity for the Industry

By Lila Ibrahim
DVD Industry Marketing Manager
Platform Marketing, Intel Corporation

DVD (Digital Versatile Disk) has established a very strong market momentum, and it is easy to understand why. DVD's growing popularity is due to a combination of factors, including its large storage capacity, backwards compatibility with CD formats, rich interactive content potential, and high-quality audio and video capability. This momentum is also driven in large measure by the power of the Pentium® II processor (http://developer.intel.com/design/PentiumII/prodbref/) which enables new types of content, as well as host-based, or software, DVD playback which helps lower the cost of implementation. Intel is continuing to work within the industry to help hardware and software developers take advantage of this tremendous opportunity.

Spinning-up market momentum
Nowhere is the PC and CE convergence more visible than in the hybrid content that is now being created on DVD. Many of the more than 1,000 movie titles already released for consumer electronics (CE) DVD players are combined with other related interactive content that is only accessible through the PC. A few examples are content-on-demand through Internet links, Internet-based on-line product catalogs for sales of movie related merchandise, and interactive games. PC users can also experience many interactive DVD-ROM software titles that have already shipped. Many more exciting interactive titles currently under development will be available this holiday season. Intel has been doing a lot to help independent software vendors create these titles at its DVD Authoring Labs and through various industry activities. The DVD technology page (http://developer.intel.com/solutions/tech/dvd.htm) in *Platform Solutions* has more information on these activities, including a list of interactive DVD-ROM titles.

With DVD as an open specification, more than one-half million CE DVD players have shipped to-date, and DVD drives are becoming standard value-added devices on today's mid- to high-end PC systems. Host-based, or software, DVD is gathering momentum in the market as well, with seven players either already announced or in development. Intel's role is to help diffuse DVD technology on PCs, and to accelerate the rollout of new host-based PC platforms.

Intel actively engaged with the industry
Intel has actively promoted DVD as part of its Visual Computing initiative (http://developer.intel.com/solutions/archive/issue1/focus.htm), and DVD is a key component of Intel's graphics roadmap. Mobile platforms are another important area for host-based DVD playback penetration. Intel's consistent support for host-based DVD and the overall movement of functionality from dedicated hardware components to software has helped reduce cost and allow new technologies to become more widely available.

In the standards area, Intel is actively participating in the DVD Forum, and was recently appointed to the Steering Committee of this traditionally consumer electronics-focused organization. Intel's participation is ensuring timely release of DVD standards that offer a good value to consumers. Intel is also one of the first companies from the PC industry to join the DVD Forum WG-4 Audio Working Group (http://www.intel.com/pressroom/archive/releases/dvd21998.htm). In addition, Intel has worked with the consumer electronics industry to define content protection for digital transmission (initially over 1394) (http://developer.intel.com/solutions/archive/issue7/stories/top4.htm) and with Hollywood to ensure that CSS copy protection will work on PCs.

Intel is assisting independent software vendors with creating exciting interactive titles. Intel and the Software Publishers' Association have published recommended MCI commands for DVD content in the near term. Intel has also worked with Microsoft Corporation to make DirectShow* compatible with host-based DVD. Intel works closely with content developers and movie studios to assure optimal playback on the PC.

Validation and testing of available DVD-ROM content is another important area of focus. Intel is hosting worldwide training and compatibility test events for third-party developers of host-based DVD players, PC manufacturers, graphics hardware vendors, and others in the industry through DVD Plugfests (http://developer.intel.com/solutions/tech/plugfests/). Intel has also been active in providing PC DVD technology training at major industry events.

Host-based DVD—a strong selling point

Host-based DVD provides today's PC consumers with one of the most compelling motivations to purchase a new system or to buy-up from a less-configured system. While DVD playback can be accomplished through hardware decoding on a lower-end system, host-based DVD works best on a system equipped with a minimum of a 300-MHz Pentium® II processor with AGP graphics (http://developer.intel.com/solutions/tech/agp.htm). Today's high-end PCs with a 400-MHz Pentium II processor and new 100-MHz system bus allow users even greater capabilities to use their PC for many different things at the same time, such as accessing Web sites while running a DVD edutainment title.

The opportunity is here and now

The success of host-based DVD offers tremendous opportunities for developers of hardware, software and content. Software vendors should develop DirectShow-based content for DVD. PC manufacturers should look for more opportunities to offer host-based DVD on their systems as a compelling feature. Independent graphics hardware vendors should actively support DVD on graphics cards. And the entertainment industry should continue to use the unique attributes of DVD to add hybrid content, including Internet-links and interactive education features to their DVD releases.

About the Author:

Lila Ibrahim is the DVD Industry Marketing Manager in Intel's Platform Marketing organization, and is based in Japan. She is responsible for working with the industry to enable "PC-friendly" DVD implementations, applications, and the promotion of the PC DVD usage model.

For More Information:

For the latest industry developments, information on DVD standards, compatibility and interoperability testing at upcoming DVD Plugfests, industry events and technical white papers, visit the DVD Technology page in *Platform Solutions*—
http://developer.intel.com/solutions/tech/dvd.htm

Adding a Dimension to the PC Space

By Stan Mo
Software Tools Marketing Manager
Developer Relations Group, Intel Corporation

A Web shopper selects a new running shoe and then flips it over to examine the tread. A group of aeronautical engineers model an entire 3D airframe using subassemblies created entirely in cyberspace and in collaboration with sub-contractors located half a world away. A high school student controls a plate tectonics modeling program to analyze the forces that caused the Himalayas to form. All of these experiences are now possible on a PC, thanks to the latest advances in platform hardware, 3D graphics technology and 3D modeling/animation applications.

The development of new 3D applications has become one of the most exciting new growth areas for the PC industry. While the most realistic 3D software technology is traditionally associated with film and TV animation, arcade-quality games and computer-aided design and modeling applications, 3D is a powerful data type that can enrich the visual computing experience in host of other ways. The most important point is that 3D no longer needs to be thought of as a visualization tool reserved for gaming or esoteric technical applications. Because it enables users to visualize even the most complex data relationships, 3D has the power to enhance a tremendous range of popular applications for business productivity, e-commerce, education and personal enjoyment.

Building blocks of the 3D platform
Delivering rich 3D content places unique demands on the PC platform. Intel is responding with balanced, high-performance solutions that are now enabling OEMs to deliver 3D-capable PCs at volume price points in 1998. Just as Intel proved that Pentium® II processor-based PCs have the power to support soft-decode of MPEG-2 video, high-end PCs are now shipping with the platform building blocks needed to support high-realism 3D rendering and animation. These platform building blocks include:

- High-speed Pentium II processors with Dual Independent Bus (D.I.B.) architecture (http://developer.intel.com/design/PentiumII/prodbref/) that provide powerful floating-point performance for geometry rendering, scene management and realistic real-time physics.

- The Intel740® graphics accelerator chip (http://developer.intel.com/design/graphics/740/index.htm) which filters, renders, applies real-time texturing and displays the scenes at rates greater than 30 frames/second.

- The Accelerated Graphics Port (http://developer.intel.com/technology/agp/), enabled in Intel® AGP chipsets, which allow large texture maps to be shared between the graphics processor and 100-MHz SDRAM.

Enabling 3D Application Development
Intel believes that the development of new 3D applications offers tremendous opportunities for the PC industry. To help turn the best ideas of software developers into reality, Intel's Developer Relations Group is actively promoting 3D technology advances in three important ways:

- By optimizing 3D run-time technologies, such as Direct3D* and OpenGL*.
- Through the support of 3D authoring tools developers can use to create, acquire, manipulate and integrate 3D content with other media, while adding interactivity in various forms.
- By promoting the creation of "3D clip art" libraries to make content more readily available to developers and PC users.

The Developer Relations Group (http://developer.intel.com/drg/) works closely with authoring tools to integrate 3D capability into applications in ways that make them run better and faster. Intel is currently working with a core group of companies, helping to enable the development of new software products for entertainment, education, reference, e-commerce, Web content development, complex data representation, CAD and gaming.

Faster 3D Downloads with Streaming Technology

One of the most compelling application areas is the use of VRML and streaming 3D technology to create "virtual 3D worlds" and deliver interactive 3D objects to users on the Web. In mid-1998, Intel will co-release an open file specification which allows the resolution of a 3D object (in terms of the total number of polygons) to be dynamically changed and the object progressively streamed for faster Internet transmission.

3D Clip Art

The Developer Relations Group is also hard at work to help the industry expand the variety and the quality of 3D content. Our objective is to create available libraries of highly realistic 3D "clip art"—from people to potatoes—that software developers can drop into their applications. Combined with the 3D open file format scheduled for mid-98 release, very high quality content can be generated which will visually scale in quality from high-end to low-end platforms. In addition, this content can be generated once and used in a variety of entertainment, creativity and education applications, on and off the Internet!

Intel—working with the industry

Intel's role is to provide PC platform solutions to the industry and disseminate enabling software technologies that will help the software industry do what it does best—develop compelling and highly creative applications and software tools that capture the imagination of PC users in every market segment. The Intel Developer Relations Group looks forward to sharing ideas with software developers who are as excited as we are about using 3D technology to expand the PC space and enhance the end-user experience.

About the Author:

Stan Mo is the Software Tools Marketing Manager for Intel's Developer Relations Group. He is responsible for working with the software industry to enable authoring tools that help developers utilize and integrate new PC platform capabilities (such as 3D) into their applications.

For More Information:

Intel Developer Relations Group Web site—
http://developer.intel.com/drg/
Intel® 3D Graphics Web site, including a realistic interactive environment—
http://developer.intel.com/technology/3d/
Pentium II processor developer Web site—
http://developer.intel.com/design/PentiumII/prodbref/
Intel740® graphics accelerator chip Web site, including Performance Software Developers Kit (SDK)—
http://developer.intel.com/design/graphics/740/index.htm
Accelerated Graphics Port technology site—
http://developer.intel.com/technology/agp/

HomeRF Extends the Reach of the PC

By Steve Whalley
Connectivity Initiatives Manager, Intel Corporation
Marketing Chairman, HomeRF Working Group

The home networking era is dawning, driven by the widespread availability of home PCs, Internet growth, and public telephone network access, as well as emerging high-speed access connections such as xDSL and cable modems. Home PCs are proliferating, creating a growing number of households with multiple PCs located throughout the home in offices, dens and bedrooms. Internet use is exploding in popularity and many homes now feature multiple-line connections to public telephone networks. To fully realize the benefits of these technologies, home users need an easy, affordable way to share resources by networking their desktop personal computers to other PCs and remote devices—including cordless telephones and data pads—in and around the home.

HomeRF is just one of several emerging PC connectivity technologies for home users. Others include conventional cabled LANs, in-home telephone line connectivity, AC power-line systems and IEEE 1394b. While all of these methods will likely play a role in future home networking applications, HomeRF is unique. It not only allows freedom of movement, HomeRF also enables the relatively low-cost implementation of networks that support spontaneous device-to-PC connections, anywhere in the home environment, without having to install any wires.

The HomeRF Working Group and SWAP
The HomeRF Shared Wireless Access Protocol (SWAP) is currently under development by the HomeRF Working Group. The Working Group includes a broad cross-section of leading companies from the PC, telecom and semiconductor industries. The five promoter companies of the HomeRF Working Group—Compaq, Hewlett-Packard, IBM, Intel, and Microsoft have been joined by 35 other leading companies from the semiconductor, telecommunications and consumer electronics industries.

The mission statement of the HomeRF Working Group is *"To bring about the existence of a broad range of interoperable consumer devices by establishing open industry specifications for unlicensed RF digital communications between PCs and CE devices anywhere in and around the home."*

Now available in version 0.1, the SWAP specification is scheduled to be released in version 0.5 in June 1998, with a completed specification scheduled for release in December of this year. One of the principal design goals behind the SWAP specification is to combine the best elements of current data and voice wireless technologies and simplify the development of new products with a single fast and interoperable system.

SWAP specifics
The SWAP specification is designed to inter-operate with both the Public Switched Telephone Network (PSTN) and the Internet. It operates in the 2.4-GHz band and employs a digital frequency-hopping spread-spectrum radio network. SWAP supports up to six full-duplex voice conversations and data rates of either 1 or 2 Mbits/sec. with a range of up to 50 meters. Supported technologies include:

- Digital Enhanced Cordless Telephony (DECT), adapted to the 2.4-GHz band and providing well-defined client call services.

- TCP/IP support of the IEEE 802.11 wireless networking specification, allowing a lower-cost implementation by eliminating some of the more complex elements of the protocol.

New home networking products
Another principal objective of the HomeRF Working Group is to support the quick time-to-market development of HomeRF base stations and a new class of remote PC devices and wireless communications products for the home.

The base station serves as the connection point for a managed network. While SWAP also permits "ad hoc"—or unmanaged—networks, such networks will support data communications only. A central

connection point will be required for a network to support time-critical applications, like interactive voice, and it also enables aggressive power management techniques for wireless clients. The base station serves as the gateway to the PSTN and can be linked to the PC via a USB connector. The SWAP network can include an essentially unlimited number of nodes in three categories:

- Voice terminals that support Time Division Multiple Access service (TDMA).
- Data nodes that support Carrier Sense Multiple Access/Collision Avoidance service (CSMA/CA).
- Voice/data nodes that support both services.

From handsets to "fridge pads"
HomeRF networks will support new products including cordless handsets combining digital cordless telephone technology with a built-in display for Internet access and data communication. LCD data pads, mounted on a high visibility locale (such as the refrigerator) will allow family members to post memos and messages from any location in and around the house. HomeRF technology also supports the remote control of intelligent home appliances and security systems. Ultimately, HomeRF networks may enable appliance control with natural voice commands by means of PC-based voice recognition software. A wireless home network also allows family members to participate in multi-player games from anywhere in the home.

Conclusion
The proliferation of home PCs and the growing popularity of the Internet are driving advances in home networking technology. Of all the possible options, HomeRF has the unique ability to extend the reach of the PC beyond the "two-foot bubble" to any location in and around the home. The new SWAP protocol, now under development by the HomeRF Working Group, is designed to enable the development of new consumer networking devices and applications for availability in 1999. Developers of PC peripherals, wireless telephony products and software should join the HomeRF Working Group now to learn how the SWAP specification can facilitate their product development. In addition, input from Working Group members plays an important role in the continuing evolution of the specification.

About the Author:
Steve Whalley is the Connectivity Initiatives Manager at Intel Corporation and the Marketing Chairman of the HomeRF Working Group. As Connectivity Initiatives Manager he is responsible for working with the industry to enable easy connections to the PC to extend its capabilities, such as USB, 1394 and HomeRF technologies.

For More Information:
Technical summaries, presentations and membership information are available at the HomeRF Web site—http://www.homerf.org/
See how Intel's Consumer Platform Development Group in Japan is using HomeRF networking technology to enable the Convergence of Consumer Electronics and PCs—http://developer.intel.com/solutions/issue/focus.htm
Read the Intel white paper on the emerging trend towards home networking—http://www.intel.com/home/network/index.htm
The Intel Developer Forum in September will provide a detailed presentation on HomeRF and SWAP—http://developer.intel.com/design/idf/

The Next Step in Network Connectivity

By Greg Young
Network Component Product Marketing Manager
Network Products Division, Intel Corporation

By any measure, network connectivity has become a paramount consideration across today's computing platforms. As more and more performance and functionality continue to be integrated on ever-smaller pieces of silicon, it's safe to say that virtually all of the next generation of desktop PCs, mobile computers and servers will provide some type of integrated network connectivity.

Some of these computing platforms will merely be pre-configured with a network interface card (NIC) to meet connectivity demands. But the continuing march of integration is also paving the way for a new wave of solutions that provide complete LAN functionality on the system motherboard. Known as LAN on motherboard (LOM) or "LAN down" solutions, these next-generation alternatives offer the simplest and most cost-effective way for system manufacturers to integrate high-performance network connectivity into their system products.

Intel: Making Connections
Intel continues to do its part to advance the frontiers of network connectivity, working closely with leading companies in the industry to define, develop and diffuse the technologies required to meet user needs, and provide broad support and compatibility with industry specifications. In addition, Intel has been active on the product front, introducing such innovative solutions as last year's Intel® 82558 Controller—the industry's first single-chip solution to provide Fast Ethernet network connectivity by integrating media access control (MAC), physical layer interface (PHY) technology, and manageability ASICs supporting Wake on LAN* (WOL) technology on the same piece of silicon. In the months since its introduction, the Intel 82558 has established itself as the leading choice among PC OEMs for their network-ready computers.

The new Intel® 82559 Controller, announced in May of 1998, builds on the success of its predecessor to provide faster and simpler network connectivity than ever before. Compared to the 82558, the Intel 82559 Controller offers several key enhancements: it's the industry's first fully integrated Fast Ethernet cross-platform solution; it's much faster, smaller and simpler to use; and it provides integrated next-generation Alert on LAN* management capabilities that build on the baseline established by the latest version of the Wired for Management (WfM) Specification.

Cross Platform Capabilities
As the first all-in-one Fast Ethernet solution for desktops, servers and mobile PCs, the Intel 82559 Controller simplifies network management by enabling developers to use the same software drivers across all platforms. In addition, the drivers are backward compatible with both the Intel 82558 and its predecessor, the Intel® 82557, further helping to unify and simplify installation and the management of network connections. The result is easier implementation for system manufacturers, and reduced complexity for end users.

Mobile Enhancements
Many of the new features of the Intel 82559 Controller make it ideal for mobile computing network connectivity. First among these is a smaller form factor, reduced some 80% compared to the 82558 and packaged in a 196-pin plastic BGA measuring 15 mm on a side. Even more significant is the 80% reduction in power consumption compared to the 82558; low power requirements of 3.3V and 125 mA optimize the Intel 82559 Controller for longer battery life in mobile PC applications.

Mobile computing is further enabled through the new controller's integration of a PCI CardBus master with a glueless interface on chip, providing OEMs with a much simpler and more cost-effective solution. In addition, the Intel 82559 Controller provides an interface for CardBus Combo designs making it suitable for LAN + Modem adapters.

Higher Performance
The Intel 82559 Controller's hardware support for IP checksumming—covering both transmitted and received packets—provides faster network throughput while reducing overall load on the networked device. Offloading tasks previously handled by the system's microprocessor results in fewer CPU cycles, increasing overall packet processing speeds by as much as 20% compared to previous-generation solutions. This feature will be first realized in the Windows NT* 5.0 operating system.

Next-Generation Management
The Intel 82559 Controller supports advanced management capabilities that build on the baseline established by the WfM 1.1 Baseline Specification. These include Alert on LAN*, one of the developments resulting from Intel's Advanced Manageability Alliance with IBM*. By sending proactive alerts over the network, Alert on LAN improves the ability of information technology staffs to recognize and respond to desktop, mobile PC and server problems, as well as monitor network connections.

In conjunction with Intel's LANDesk® Client Manager (Alert on LAN support is integrated into LANDesk Client Manager V3.1 and later), the 82559 provides notification of system software and hardware failures. Evidence of tampering can be identified even when the PC is powered down, the operating system is not loaded, or the system is remotely located via the LAN.

Future Enhancements
Intel is working closely with PC OEMs and key vendors in the networking industry to define and develop the next generation of NIC, CardBus and LOM enhancements to network connectivity. The result: extended performance, functionality and manageability—while also providing a simple, reliable and cost-effective solution for network connectivity.

About the Author:
Greg Young is the Product Marketing Manager for Intel's networking components, focused upon next generation integrated Fast Ethernet solutions for PC manufacturers. He is responsible for marketing Intel's Ethernet components for use in LAN adapters, LAN on motherboard, and LAN networking system products.

For More Information:
Intel 82559 Controller press release—
http://www.intel.com/pressroom/archive/releases/fe052698.htm
Other Intel networking components—
http://developer.intel.com/design/network
Network Connection to Manageability—
http://www.intel.com/network/blocks/
Alert on LAN press releases—
http://www.intel.com/pressroom/archive/releases/WM021898.HTM
http://www.intel.com/pressroom/archive/releases/LD041598.HTM
Intel's Wired for Management Web site for developers—
http://developer.intel.com/ial/wfm

* Wake on LAN and Alert on LAN are results of the IBM/Intel Advanced Manageability Alliance and are trademarks of IBM Corporation.

Extending Pre-Boot Execution (PXE) to Mobile Platforms

By Mike Henry
Engineering Manager
Intel Architecture Lab, Intel Corporation

One of the most common problems faced by today's IT managers is finding ways to automate new system setup or recover from hard drive corruption or failure. This type of task takes a significant amount of time and effort for a technician or user to perform. What is needed is a predictable, interoperable way for clients to interact with the network, in a pre-boot environment (with or without an operating system), so that they can automatically download the appropriate software images and configuration parameters to meet the needs of different types of users. With this capability IT managers could reduce the amount of time and effort for new system setup and emergency recovery, thus reducing the total cost of ownership.

Beginning with the introduction of Network PCs (Net PCs) last year, a specification known as **P**re-Boot E**X**ecution **E**nvironment (PXE) has been widely adopted to meet these evolving boot requirements. PXE is now an integral part of a wide range of business desktop PCs introduced by some two dozen PC OEMs. Intel was actively involved in driving the first PXE specification, and is now helping to expand the parameters of PXE by developing a next-generation specification designed to accommodate the needs of mobile "occasionally connected" PC users.

The Evolution of PXE
The current version of PXE was established as a subset of the Intel-driven industry initiatives of Wired for Management (WfM) 1.1a (ftp://download.intel.com/ial/wfm/baseline.pdf), PC 98 (http://developer.intel.com/solutions/tech/pc98.htm), Network PC Design Guidelines 1.0b (ftp://download.intel.com/ial/wfm/netpc.pdf), and the Lean Client (http://developer.intel.com/solutions/issue/stories/top6.htm). PXE embodies three technologies that establish a common and consistent set of pre-boot services with the boot firmware of Intel® Architecture-based systems:

- A uniform protocol for the client to request the allocation of a network IP address, and subsequently request the downloading of a Network Bootstrap Program (NBP) from a network boot server
- A set of APIs available in the pre-boot firmware environment of the system that constitute a consistent set of services that can be employed by the NBP or the BIOS
- A standard method of initiating the pre-boot firmware to execute the PXE protocol on a client machine

These technologies combine to enhance the manageability of client systems in a number of situations, including remote new system setup, remote emergency boot, and remote network boot. By providing an open industry specification, enabling tools, and interoperability testing, Intel and other industry leaders have created a specification that has been widely adopted by OEMs, IHVs and ISVs, and is now being deployed by information technology staffs throughout many of today's large enterprises. Now, Intel is helping to evolve the PXE spec to take advantage of new environments and usage models—in particular, mobile and occasionally connected users.

New Split ROM Architecture
The new enhanced PXE specification improves the user model, extends the benefits of PXE to Cardbus NICs and the BIOS itself, and simplifies the challenges facing OEMs and IHVs by making the network adapter serve as a universal boot device.

The first key to this evolution is an innovative approach that splits the PXE architecture into three ROMs: the "base code," the "network interface code" and the "Cardbus driver code." This "split ROM" technology, provides three significant implementation benefits. First, it allows a single instance of the "base code" to support one or more instances of "network interface code," resulting in more efficient use of flash space. This will be particularly true in Mobile PC implementations using Cardbus NICs. In

general, Cardbus NICs do not provide on-board flash storage. The split ROM approach will allow adding support for several Cardbus NICs in the BIOS without having to replicate the base code and Cardbus driver code for each supported NIC.

Second, it allows the “network interface code” to be carried on the NIC without the additional cost of carrying the base code (which is carried in the BIOS). This will reduce the cost of nonvolatile storage on the NIC.

Third, the “split ROM” architecture allows the BIOS to make direct use of the “network interface code” before and during POST. For instance, if the PC fails to boot this will allow the BIOS to use the NIC to send an alert through the PXE Universal Network Driver Interface (UNDI) API to the network.

Evolving to benefit all users

The second key to the PXE evolution is the inclusion of boot server discovery in the protocol. Using this method, the booting client can discover an appropriate boot server from a list of available boot servers, provided to the client by the IT administrator during the initial phase of the remote boot. The IT administrator can assign boot server types to clients based on the client’s system architecture type or even each client’s unique ID.

The ultimate benefit of the split-ROM PXE architecture is that both desktop and mobile users will be able to plug a PC into the network, have it automatically discover specific boot servers across the enterprise and request a boot file from that boot server. This will allow new PCs (even with blank hard drives) immediate connection to IT administered new system setup servers. It will also provide for emergency remote boot in the case of hard drive failures or corruptions, allowing work to proceed while waiting for the repair technician. PXE can also be used as the normal boot device for network computer applications.

PXE and Wired for Management 2.0

Intel is working to drive the incorporation of the new PXE spec within the framework of the upcoming revision of the WfM Baseline Specification (version 2.0). The new PXE spec was submitted for public review on June 15th and will be revised based on input before final introduction. While PXE will remain an important part of the WfM initiative, the latest enhancements to the spec will enable it to assume a position as its own standalone specification, PXE 1.0.

OEMs, IHVs, and ISVs who have not already implemented PXE in their products should take note of these latest developments—not only to implement the current spec today, but to be ready to take advantage of the latest enhancements now being adopted.

About the Author:

Mike Henry is an engineering manager for the Intel Architecture Laboratory (IAL). He is responsible for developing and executing Intel’s PXE technology initiatives.

For More Information:

Press Release: 3Com and SystemSoft are First to Demonstrate Pre-Boot Managed PC Solution for Notebook Computers—
http://biz.yahoo.com/bw/980616/3com_syste_1.html

For information about the Wired for Management Initiative and WfM Baseline specification, please visit Intel’s Wired for Management developer site—
http://developer.intel.com/ial/wfm

Review the latest draft of PXE and WfM Specs at the WfM spec Web site—
http://developer.intel.com/ial/wfm/wfmspecs.htm

To get the latest Wired for Management news, visit the WfM technology page in *Platform Solutions* on a monthly basis—
http://developer.intel.com/solutions/tech/wfm.htm

Platform News

Business

Live webcast on June 29 announcing the Pentium® II Xeon™ processor.
Register now for more information!
The newest addition to the Intel Inside® brand family, the Pentium II Xeon processor is Intel's powerful new processor designed exclusively for midrange and higher servers and workstations. See presentations and demos from Intel's executives on how this new processor will take Intel into the heart of the enterprise.
http://www.intel.com/PentiumII/Xeon/Webcast/index.htm

Wired for Management 2.0 Draft Specification Availble for Review
The Wired for Management (WfM) Baseline specification 2.0 draft is now available for industry review. A release candidate draft version of the WfM Baseline specification 2.0 along with related specs for the **P**reboot e**X**ecution **E**nvironment (PXE) and Boot Integrity Services (BIS) are now available for industry review. These specifications are designed to reduce the total cost of ownership for business computing.
http://developer.intel.com/ial/wfm/wfmspecs.htm

Presentations available from the Desktop Management Task Force (DMTF) annual conference
This conference took place on June 2 – 3 and includes keynote presentations as well as DMTF roadmap, technology and challenges, DMI and CIM.
http://www.dmtf.org/conference/schedule.html

Home

New Intel® Celeron™ Processor at 300 MHz for Basic PCs; Major OEMs Announce Systems
Intel introduced the Intel® Celeron™ processor at 300 MHz, the second member of that processor family designed to meet the core computing and affordability needs of the sub-$1,200 Basic PC market segment. This new processor meets the core needs and affordability requirements common to many new consumer and business users. The Intel Celeron processor provides the performance for applications running on operating systems such as Windows* 95. The processor core has 7.5M transistors and is based on Intel's advanced 0.25 micron CMOS process technology.
http://developer.intel.com/design/celeron/

Mobile

Intel Ships Industry's First High-Speed Managed Mobile Adapter
Intel introduced the industry's first managed combination CardBus mobile adapter, designed to help businesses lower the costs associated with mobile computing by providing a combination adapter with built-in management capabilities. The Intel® PRO/100 LAN+Modem56 CardBus mobile adapter integrates a 10/100-Mpbs (Megabits-per-second) Ethernet adapter and a 56-Kbps (Kilobits-per-second) modem in a single adapter delivering the fastest speeds available for both technologies.
http://www.intel.com/pressroom/archive/releases/FE061698.HTM

Telecommunications and PC Leaders Join to Deliver Enhanced Wireless Communications
On May 20 industry leaders Ericsson*, IBM*, Intel, Nokia* and Toshiba* unveiled their vision to revolutionize wireless connectivity for personal and business mobile devices. Enabling seamless voice and data transmission via wireless, short-range radio, this new technology will allow users to connect a wide range of devices easily and quickly, without the need for cables, expanding communications capabilities for mobile computers, mobile phones and other mobile devices, both in and out of the office. The open specification for this innovative technology, code-named "Bluetooth," is being developed through the combined contributions of the members of the Bluetooth Special Interest Group (SIG).
http://developer.intel.com/design/mobile/bluetooth/

Server

New white paper describes Intel's Enterprise Strategy for the New Century
Intel has several important, yet seemingly disparate, technology projects underway that will position Intel® Architecture (IA)-based servers as enterprise-class systems. In this Strategy Profile, the Aberdeen Group articulates how these technologies fit together into a cohesive strategy that will position Intel Architecture-based servers as enterprise-grade systems as we move into the 21st century.
http://www.intel.com/procs/servers/feature/aberdeen/index.htm

Intelligent Platform Management Interface (IPMI) v0.9 specification available for review
Intel, Dell*, HP* and NEC* invite the industry to review version 0.9 of the IPMI specification and provide feedback. IPMI version 1.0, which will include industry feedback, is anticipated to be available late Q3 '98. All feedback will be carefully tracked, evaluated and incorporated as appropriate. The specifications can be downloaded from IPMI web site. http://developer.intel.com/design/servers/ipmi/

Technology News

DVD

Intel Developer Forum DVD Plugfest Europe - Coming July 7-8
The best opportunity to test your DVD product with others in the industry is at the upcoming Intel Developer Forum DVD Plugfest. This event is hosted by Intel Corporation to promote the development of interoperable DVD products for personal computers. The primary function of this event is interoperability testing. In addition, attendees will have the opportunity to experience: DVD OEM matchmaking; hot DVD-ROM bundling opportunities; get the scoop on DVD retailing; see the coolest new DVD-ROM titles; attend one-on-one sessions with DVD technical experts; participate in roundtable discussions on DVD state of the union; and see demonstrations of the Pentium® II Xeon™ processor and the Intel® Celeron® processor based systems. System OEMs, graphics hardware vendors, CODEC suppliers (hardware and/or software), DVD drive manufacturers, and software/movie content providers should plan on attending. For more information please visit our webiste at
http://developer.intel.com/solutions/tech/plugfests/europe.htm

Intel appointed to the DVD Forum Steering Committee
Intel was recently appointed onto the DVD Forum Steering Committee, the governing body of the DVD Forum. Dan Russell, Director of Platform Marketing of Intel Corporation, said, "the DVD family of formats is an important advancement in technology and a key initiative to evolving the PC platform. DVD technology provides PC users the capability to play rich interactive content and movies on their PCs, while reaching a new level of quality. Intel looks forward to continuing our DVD enabling and market expansion efforts as a member of the DVD Forum Steering Committee."
http://www.dvdforum.org

New DVD Technology Newsgroup Now Available
Intel is pleased to announce the creation of the DVD technology newsgroup. Developers are encouraged to visit the group and submit any questions that you may have regarding DVD technology and its implementation on the PC platform.
http://support.intel.com/newsgroups/dvd.htm

USB

Simple Rules in Building USB Devices and Cable Assemblies
USB technology promises end-users the ability to hot-attach peripherals and adapters, an evolutionary next step in plug-and-play expansion without opening the box. To deliver on this promise, device and interconnect providers need to adhere to a few simple rules. A short summary of these rules is now available at the USB technology page in Platform Solutions.
http://developer.intel.com/solutions/tech/usb.htm

1394

New 1394 Web site Now Available
1394 is a universal connection between PC and CE devices. It is a true Plug and Play interconnect that allows digital video editing on your PC and it is coming soon to your Pentium(r) II processor based PC. For the latest 1394 Technology information visit the new 1394 web site.
http://developer.intel.com/technology/1394/

New 1394 Technology Newsgroup Now Available
Intel is pleased to announce the creation of the 1394 technology newsgroup. Developers are encouraged to visit the group and submit any questions that you may have regarding 1394 technology and its implementation on the PC platform.
http://support.intel.com/newsgroups/1394.htm

Instantly Available PC

New Instantly Available PC Web site Now Available
This new site features updates on industry activities, design guides, specifications and a reference platform to help make your next system design 'Instantly Available.
http://developer.intel.com/technology/iapc/

PC98 and PC 99

Summary of Differences between PC 99 and PC 98 Updated
The summary of differences between PC 99 and PC 98 has been updated on the PC 98 and PC 99 technology page at Platform Solutions online.
http://developer.intel.com/solutions/tech/pc98.htm

Platform Performance Tuning

IPEAK Graphics Performance Toolkit (GPT) Version 1.0 is shipping now
The IPEAK GPT helps you optimize your 3D applications by analyzing performance and identifying performance bottlenecks. The GPT is priced at $279 and can be ordered by calling 1-800-538-3373 ext. 301 (US and Canada) and 1-503-727-7897 (international). Additional pricing and ordering information is available at the IPEAK web site.
http://developer.intel.com/design/ipeak/gfxtool/index.htm

System Design

New White Paper on Tool Capabilities for Designing 100-MHz Interconnects
Printed circuit board design complexity increases greatly as bus speeds exceed 100MHz. This increased complexity is due more to the large number of simulations a designer must complete rather than simulation or modeling accuracy. This paper presents the case for these increased numbers of simulations, and presents techniques for managing this complexity including the usage of 3D simulation tools.
http://developer.intel.com/ial/sdt/tsch_asp.pdf

Industry Events

Web Design & Development '98 West
June 21–25, San Francisco, CA
This conference is designed to connect web developers and offer education about how to improve web design. Intel's Jerry Weber will be presenting "Low Bandwidth Special Effects for the Internet" on June 25th. For more information, please visit the event Web site.
http://www.web98.com

2nd Annual U.S. 1394 Developer's Conference
June 29–July 2, San Jose, CA
Please visit the 1394 event site for more details.
http://www.1394ta.org/upevents/overview.html

DVD Plugfest
July 8, Munich, Germany
The upcoming Intel Developer Forum DVD Plugfest will be held in Munich, Germany. This event is sponsored by Intel Corporation to promote the development of interoperable DVD products for personal computers.
http://developer.intel.com/solutions/tech/plugfests/europe.htm

Internet World—Summer
July 13–17, Chicago, IL
Focuses on breakthrough technologies and products from leading innovators, devoted exclusively to the Internet and World Wide Web. Intel's Ken Stober to present PC/TV.
For more information visit the Internet World Web site.
http://events.internet.com

Siggraph '98
July 21–23, Orlando, FL
Provides marketplace for computer graphics equipment and services. For more information please contact the Siggraph Web site.
http://www.siggraph.org/s98/s98main.html

HP World '98
August 2–8, San Diego, CA
HP strategic and tactical solutions come together at this event. Focusing on technology, connectivity, and platforms. Intel will have three speakers. For more information, please contact HP's Web site.
http://www.hpworld.org/

California Computer Expo
August 20–23, San Diego, CA
Enhancing the home and office through computer technology, Intel will present a paper on "Home Networking - Unleashing the Power of the Multi-PC Home.
http://www.computoredge.com/expo/

Intel Developer Forum
September 15–17, Palm Springs, CA
Features 12 graduate level technology training tracks. Over 70 technical sessions will focus on the latest desktop, mobile, server, workstation, and embedded platform technologies with direct access to Intel's top engineers and architects.
http://developer.intel.com/design/idf

Power 98
October 4–7 Santa Clara, CA.
This conference brings together leading manufacturers of batteries, power supply systems, electronics components, mobile computing products, and wireless communications devices. Intel's Bob Jackson will participate on a panel on power management.
http://www.gigaweb.com/events/

Fall Internet World 98
October 6–8, New York, N.Y
Conference provides opportunity to learn about Internet, Intranet, and Web applications
Intel's Gregg Adkin and Ken Stober will participate in a panel discussion on "Web TV."
http://events.internet.com

Next Generation Networks
November 2–6, Washington D.C.
Understanding the future trends in high performance networking. Intel's Chuck Smith, will present New Development in Networked Collaboration," on November 4th.

Comdex Fall
November 16–20, Las Vegas, Nevada
Major show for computer industry's independent resellers of computer systems and related products.
http://www.comdex.com

Intel Networking Events & Training
For Intel's events and training programs on networking products and technologies, please visit the Intel networking events page.
http://www.intel.com/network/events/index.htm

—End of Platform Solutions Issue 10—